

# PATENT SPECIFICATION

630,981

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## PROVISIONAL SPECIFICATION.

### Improvements in and relating to Compositions for Ignition of Combustible Gas Producing Charges

We, PERCY ALFRED HARRY GOLDSMITH, a British subject, of Ardenlea, Preston Lane, Faversham, in the County of Kent, and HEATERS LIMITED, a Company registered under the laws of Great Britain, of 20, Copt-hall Avenue, London, E.C.2, do hereby declare the nature of this invention to be as follows:—

This invention relates to compositions for ignition of combustible gas producing charges or heating mixtures of blasting cartridges in which the blasting medium is a non-combustible gas such as carbon dioxide confined under pressure in a container.

In Patent No. 560,227 there is described a composition of the above character comprising an oxidiser, for example potassium perchlorate, and a fuel viz., sodium or potassium salicylate which is in the form of a consolidated mixture having a resistance wire embedded therein or packed in a container of combustible material in close contact with a resistance wire could be employed as a primer for igniting a gas producing charge and the composition could include an endothermic salt to prevent ignition in air at ordinary temperatures.

The object of the present invention is to provide improved compositions for the above purpose and according to the present invention the composition comprises a fuel consisting of combustible organic carbon containing compound and an oxygen carrier. The carbon content of the compound should be not less than  $1/5$  of and not greater than substantially  $4/5$  of its molecular weight and preferably in amount sufficient to satisfy the oxygen content of the carrier.

The physical properties of the fuel employed are that it is solid at ordinary temperatures and capable of being comminuted to permit intimate admixture with the other constituent or constituents of the mixture; it is non-hygroscopic and sparingly soluble in water and the melting point should be within the range of  $60^{\circ}\text{C}$ . to  $220^{\circ}\text{C}$ . A metal in a finely divided form may also be included in the composition. Specific Examples of compositions which have been tried and found satisfactory are as follows:—

Example 1.	Potassium Perchlorate	89%	
"	Stearic Acid	11%	
" 2.	Potassium Perchlorate	86%	60
"	Palmitic	14%	
" 3.	Potassium Perchlorate	50%	
"	Pot. Bi Tartrate	50%	
" 4.	Potassium Perchlorate	75%	
"	Cane Sugar	25%	55
" 5.	Potassium Perchlorate	75%	
"	Lactose	25%	
" 6.	Potassium Perchlorate	84%	
"	Cellulose	16%	
" 7.	Potassium Perchlorate	80%	60
"	Pot. Hydrogen Phthalate	20%	
" 8.	Potassium Perchlorate	78.5%	
"	Potassium Benzoate	21.5%	
" 9.	Potassium Perchlorate	84%	
"	Phthalic Anhydride	16%	65

From the foregoing it will be understood that the fuel may be a fatty acid, a salt of a dibasic acid, a carbohydrate, a salt of an aromatic acid or an anhydride of an aromatic acid.

It has been found that the salts usually render the mixture more exothermic and somewhat more sensitive. In this respect, the potassium salts appear to be most suitable although other metal salts, for example, of Barium, Strontium, 75

may be employed.

In intimate admixture with Potassium Perchlorate, by careful sizing and mixing, any of the above fuels yield an igniting mixture capable of initiating a heating or gas-producing charge 80 such as described in Specifications Nos. 413,823 or 480,330.

While a two-component mixture, consisting of Potassium Perchlorate and a single fuel may be employed, a proportion of two fuels could be 85 employed.

If it is desired to render the composition such that it will not sustain its own combustion in free air, an endothermic salt which can yield a large gas volume can be added. The proportion of the endothermic salt to be admixed depends on the rate of decomposition and the heat values of the particular oxidiser-fuel mixture and these factors are influenced by the 90

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melting point and by the rate of reaction of the carbon from the fuel with the oxygen from the Potassium Perchlorate: a larger proportion of the salt would normally have to be used with a more sensitive or more readily decomposable oxidiser-fuel mixture. These salts should, like Potassium Perchlorate and the fuels, be non-hygroscopic and only sparingly soluble in water. Examples of compositions according to the foregoing statement which have been tried and found satisfactory, are:—

	Example 1.	Potassium Perchlorate	63%
		Palmitic Acid	12%
		Ammonium Oxalate	25%
15	" 2.	Potassium Perchlorate	45%
		Pot. Bitartrate	45%
		Ammonium Oxalate	10%
	" 3.	Potassium Perchlorate	54%
		Cane Sugar	18%
20	" 4.	Potassium Perchlorate	54%
		Ammonium Oxalate	28%
		Lactose	18%
		Ammonium Oxalate	28%

Example 5.	Potassium Perchlorate	60%	25
"	Pot. Hydrogen Phthalate	15%	
"	Ammonium Oxalate	25%	
" 6.	Potassium Perchlorate	55%	
	Pot. Benzoate	15%	
	Ammonium Oxalate	30%	
" 7.	Potassium Perchlorate	63%	80
	Phthalic Anhydride	12%	
	Ammonium Oxalate	25%	

Other endothermic salts may be employed, examples of which are zinc sulphate and sodium bicarbonate.

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The two kinds of priming mixture can be employed in manufacture of igniting means known in the art, viz., as a dry powder, filled into paper containers, or as a consolidated mixture in the form of a fuse or match head.

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Either device will have a fuse wire which will give a maximum amount of heat consistent with its strength and it has been found that a nickel chrome wire of a resistance of 1,500/2,000 ohms per yard is the most suitable.

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Dated this 22nd day of November, 1946.

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### COMPLETE SPECIFICATION.

#### Improvements in and relating to Compositions for Ignition of Combustible Gas Producing Charges or Heating Mixtures.

We, PERCY ALFRED HARRY GOLDSMITH, a British subject, of Ardenlea, Preston Lane, Faversham, in the County of Kent, and HEATERS LIMITED, a Company registered 60 under the laws of Great Britain, of 20, Copt-hall, Avenue, London, E.C.2, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to compositions for ignition of combustible gas producing charges or heating mixtures of blasting cartridges of the kind in which the blasting medium is a non-combustible gas such as carbon dioxide confined under pressure in a container.

In British Patent No. 560,227 there is described a composition of the above character comprising an oxidiser, for example potassium perchlorate, and a fuel viz., sodium or potassium salicylate which may be a consolidated mixture in the form of a match head having a resistance wire embedded therein or packed in a container of combustible material in close contact with 70 a resistance wire which could be employed as a primer for igniting a gas producing charge and the composition could include an endothermic salt to prevent ignition in air at ordinary temperatures.

The object of the present invention is to provide improved compositions for the above purpose and according to the present invention the composition comprises a combustible organic carbon-containing compound and potassium perchlorate, the carbon content of the compound being not less than  $1/5$  of and not greater than substantially  $4/5$  of its molecular weight and

in amount sufficient or substantially sufficient to satisfy the available oxygen content of the perchlorate, the compound being non-hygroscopic, solid at ordinary temperatures and capable of being comminuted to permit intimate admixture with the perchlorate, the mixture being in the form of a match head or contained in a combustible container either form having a fuse wire embedded in the mixture. A metal in a finely divided form may also be included as a constituent of the mixture.

Specific examples of mixtures which have been tried and found satisfactory are as follows:—

Example 1.	Potassium Perchlorate	89%	
"	Stearic Acid	11%	
" 2.	Potassium Perchlorate	86%	
	Palmitic Acid	14%	100
" 3.	Potassium Perchlorate	50%	
	Pot. Bi Tartrate	50%	
" 4.	Potassium Perchlorate	75%	
	Cane Sugar	25%	
" 5.	Potassium Perchlorate	75%	105
	Lactose	25%	
" 6.	Potassium Perchlorate	84%	
	Cellulose	16%	
" 7.	Potassium Perchlorate	80%	
	Pot. Hydrogen Phthalate	20%	110
" 8.	Potassium Perchlorate	78.5%	
	Potassium Benzoate	21.5%	
" 9.	Potassium Perchlorate	84%	
	Phthalic Anhydride	16%	
" 10.	Potassium Perchlorate	87%	115
	Thymol	13%	
" 11.	Potassium Perchlorate	84%	
	Metaldehyde	16%	

From the foregoing it will be understood that

the fuel may be a fatty acid, a salt of a dibasic organic acid, a carbohydrate, a salt of an aromatic acid or an anhydride of an aromatic acid, a phenol or an aldehyde. It has been found that the salts usually render the mixture more exothermic and somewhat more sensitive. In this respect, the potassium salts appear to be most suitable although other metal salts, for example, of barium or strontium, may be employed.

In intimate admixture with potassium perchlorate, by careful sizing and mixing, any of the above fuels yield an igniting mixture capable of initiating a heating or gas-producing charge such as described in British Specifications Nos. 413,823 or 480,330.

While a two-component mixture, consisting of potassium perchlorate and a single fuel may be employed, a proportion of two fuels could be employed.

If it is desired to render the composition such that it will not sustain its own combustion in free air, an endothermic salt which can yield a large gas volume can be added. The proportion of the endothermic salt to be admixed depends on the rate of decomposition and the heat values of the particular mixture and these factors are influenced by the melting point and by the rate of reaction of the carbon from the fuel with the oxygen from the potassium perchlorate a larger portion of the endothermic salt would normally have to be used with a more sensitive or more readily decomposable mixture. These endothermic salts should, like potassium perchlorate and the fuels, be non-hygroscopic and only sparingly soluble in water.

Examples of compositions according to the foregoing statement which have been tried and found satisfactory are:—

40	Example 12. Potassium Perchlorate	63%
	Palmitic Acid	12%
	Ammonium Oxalate	25%
"	13. Potassium Perchlorate	45%
	Potassium Bitartrate	45%
	Ammonium Oxalate	10%
45	" 14. Potassium Perchlorate	54%
	Cane Sugar	18%
	Ammonium Oxalate	28%
"	15. Potassium Perchlorate	54%
	Lactose	18%
	Ammonium Oxalate	28%
50	" 16. Potassium Perchlorate	60%
	Pot. Hydrogen Phthalate	15%
	Ammonium Oxalate	25%
55	" 17. Potassium Perchlorate	55%
	Pot. Benzoate	15%
	Ammonium Oxalate	30%
"	18. Potassium Perchlorate	63%
	Phthalic Anhydride	12%
	Ammonium Oxalate	25%
60	" 19. Potassium Perchlorate	74%
	Thymol	11%
	Ammonium Oxalate	15%

Example 20. Potassium Perchlorate 75.5%  
    Metalddehyde 14.5% 65  
    Ammonium Oxalate 10%

Other endothermic salts may be employed, Examples of which are zinc sulphate and sodium bicarbonate.

The two kinds of priming mixture are employed in manufacture of igniting means known in the art, viz., as a dry powder, filled into paper containers, or as a consolidated mixture in the form of a fuse or match head.

Either device will have a fuse wire which will give a maximum amount of heat consistent with its strength and it has been found that a nickel chrome wire of a resistance within the range of 1,500/2,000 ohms per yard is the most suitable.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. An igniter for combustible gas producing charges or heating mixtures of blasting cartridges of the kind described comprising a mixture of a combustible organic carbon compound and potassium perchlorate, the carbon content of the carbon compound being not less than 1/5 of and not greater than substantially 4/5 of its molecular weight and in amount sufficient or substantially sufficient to satisfy the available oxygen of the perchlorate, the carbon compound being non-hygroscopic, solid at atmospheric temperatures and capable of being comminuted to permit intimate mixture with the perchlorate, the mixture being in the form of a fuse or match head or contained in a combustible container, either form having a fuse wire embedded in the mixture. 100

2. An igniter as claimed in Claim 1, wherein the mixture also contains metal in a finely divided form.

3. An igniter as claimed in Claim 1, wherein the mixture is according to any one of Examples 1 to 11. 105

4. An igniter as claimed in Claim 1, wherein the mixture is according to any one of Examples 12 to 20.

5. An igniter as claimed in Claim 1, 2, 3 or 4, consolidated in the form of a fuse or match head wherein the fuse wire is of a resistance within the range of 1,500 to 2,000 ohms per yard. 110

6. An igniter as claimed in Claim 1, comprising a paper container having therein a mixture according to Claim 1, 2, 3 or 4, the mixture having embedded therein a fuse wire of a resistance within the range of 1,500 to 2,000 ohms per yard. 120

Dated this 5th day of September, 1947.

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